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Universal approach to overcoming nonstationarity, unsteadiness and non-Markovity of stochastic processes in complex systems

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Abstract

In the present paper, we suggest a new universal approach to study complex systems by microscopic, mesoscopic and macroscopic methods. We discuss new possibilities of extracting information on nonstationarity, unsteadiness and non-Markovity of discrete stochastic processes in complex systems. We consider statistical properties of the fast, intermediate and slow components of the investigated processes in complex systems within the framework of microscopic, mesoscopic and macroscopic approaches separately. Among them theoretical analysis is carried out by means of local noisy time-dependent parameters and the conception of a quasi-Brownian particle (QBP) (mesoscopic approach) as well as the use of wavelet transformation of the initial row time series. As a concrete example we examine the seismic time series data for strong and weak earthquakes in Turkey (1998, 1999) in detail, as well as technogenic explosions. We propose a new possible solution to the problem of forecasting strong earthquakes. Besides we have found out that an unexpected restoration of the first two local noisy parameters in weak earthquakes and technogenic explosions is determined by exponential law. In this paper we have also carried out the comparison and

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